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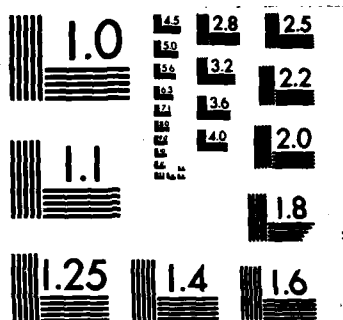
NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
WHITES MILL POND DAM (U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV JUN 80

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AD-A155 381

CONNECTICUT RIVER BASIN
WINCHENDON, MASSACHUSETTS

WHITES MILL POND DAM
MA 00630

**PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM**

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The dam is a 340 ft. long earthfill dam with upstream and downstream dry stone masonry walls. It has a masonry walls. there are serious deficiencies which must be corrected to assure the continued performance of this dam. Generally the dam is in poor condition. The dam has been classified as small in size with a high hazard potential.		

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424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:

NEDED-E

DEC 29 1980

Honorable Edward J. King
Governor of the Commonwealth of
Massachusetts
State House
Boston, Massachusetts

Dear Governor King:

Inclosed is a copy of the Whites Mill Pond Dam (MA-00630) Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. The report is based upon a visual inspection, a review of past performance, and a preliminary hydrological analysis. A brief assessment is included at the beginning of the report.

The preliminary hydrologic analysis has indicated that the spillway capacity for the Whites Mill Pond Dam would likely be exceeded by floods greater than 11 percent of the Probable Maximum Flood (PMF), the test flood for spillway adequacy. Our screening criteria specifies that a dam of this class which does not have sufficient spillway capacity to discharge fifty percent of the PMF, should be adjudged as having a seriously inadequate spillway and the dam assessed as unsafe, non-emergency, until more detailed studies prove otherwise or corrective measures are completed.

The term "unsafe" applied to a dam because of an inadequate spillway does not indicate the same degree of emergency as that term would if applied because of structural deficiency. It does indicate, however, that a severe storm may cause overtopping and possible failure of the dam, with significant damage and potential loss of life downstream.

It is recommended that within twelve months from the date of this report the owner of the dam engage the services of a professional or consulting engineer to determine by more sophisticated methods and procedures the magnitude of the spillway deficiency. Based on this determination, appropriate remedial mitigating measures should be designed and completed within 24 months of this date of notification. In the interim a detailed emergency operation plan and warning system should be promptly developed. During periods of unusually heavy precipitation, round-the-clock surveillance should be provided.

NEDED-E

Honorable Edward J. King

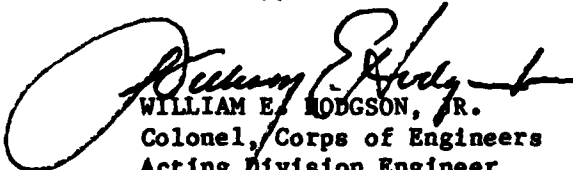
I have approved the report and support the findings and recommendations described in Section 7, with qualifications as noted above. I request that you keep me informed of the actions taken to implement these recommendations since this follow-up is an important part of the non-Federal Dam Inspection Program.

A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. This report has also been furnished to the owner of the project, Ray Plastics, Inc., Winchendon, MA.

Copies of this report will be made available to the public, upon request to this office, under the Freedom of Information Act, thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Quality Engineering for the cooperation extended in carrying out this program.

Sincerely,


WILLIAM E. HODGSON, JR.
Colonel, Corps of Engineers
Acting Division Engineer

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WHITE'S MILL POND DAM

MA 00630

CONNECTICUT RIVER BASIN
WINCHENDON, MASSACHUSETTS

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION
PROGRAM

NATIONAL DAM INSPECTION
PROGRAM

PHASE I INSPECTION REPORT

BRIEF ASSESSMENT

Identification No.: MA00630

Name of Dam: White's Mill Pond

Town: Winchendon

County and State: Worcester County, Massachusetts

Stream: North branch of the Millers River, tributary
of the Connecticut River

Date of Inspection: May 7, 1980

White's Mill Pond Dam which was built before 1923 is a 340-foot long earthfill dam with upstream and downstream dry stone masonry walls. The dam has a maximum height of 13 feet and consists of a spillway, low level outlet, an intake to a plant, and an earth dike. The top of the dam is at Elevation (El) 1040.7. The spillway is a broad crested weir, 24 feet long, with the crest at El 1037. The low level outlet is 3.2 feet wide by 1.8 feet high, stone box channel and is manually controlled by a slide gate which is buried in the dam. A 3.0-foot high earth dike, 140 feet long, is located 60 feet east of the dam.

There are serious deficiencies which must be corrected to assure the continued performance of this dam. This conclusion is based on the visual inspection of the site and a review of the available data. Generally the dam is in poor condition.

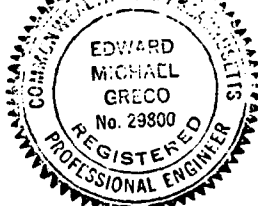
The following deficiencies were observed at the site: severe seepage at several locations along the toe of the dam; downstream stone masonry walls are out of plumb; lack of access to the low level outlet operator; erosion at the low point of the dam crest; bulging of the downstream masonry wall in several locations; stone missing from the upstream face of the spillway, mortar missing from the stone masonry spillway of the dam; heavy growth of brush and trees on the dam crest and on the dike; and an accumulation of debris in the discharge channel.


WHITE'S MILL POND DAM


Based on Corps of Engineers' guidelines, the dam has been classified in the small size and high hazard categories. A test flood equal to one-half the probable maximum flood (PMF) was used to evaluate the capacity of the spillway. The drainage area for White's Mill Pond is 0.94 square miles exclusive of Lake Monomanac. The pond is separated from Lake Monomanac by the Springville Dam and the Mill Circle Road Dam, which is a small dam with a 30-inch siphon. Mill Circle Road Dam has a crest elevation of 1053.5. Assuming that this dam does not fail the inflow through the siphon and over the dam under the test flood conditions is 110 cfs. The test flood inflow including flow from the siphon is calculated to be 956 cubic feet per second (cfs). The test flood outflow is 680 cfs, resulting in a pond level at El 1041.1. The test flood would overtop the dam by 0.4 feet. -Hydraulic analyses indicate that the spillway (without stoplogs) can discharge 520 cfs, or 76 percent of the test flood outflow before the dam is overtopped. (With stoplogs, the spillway can discharge 170 cfs or 22 percent of the test flood outflow before the dam is overtopped). This amount of flow will produce a backwater about 3 feet high in the channel at the factory. Failure of the dam at maximum flow would produce a downstream flow of 3,270 cfs which would cause the backwater to rise an additional 13 feet at the factory to El 1033.1.

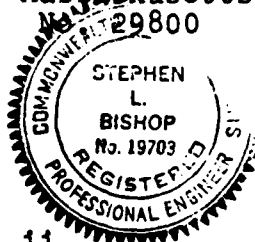
It is recommended that the Owner employ a qualified registered professional engineer to conduct a more detailed hydraulic and hydrologic study of the spillway, evaluate the severe seepage at the toe of the dam, and evaluate the stability of the dam. Until the recommendations resulting from these investigations are implemented, the Owner should immediately remove the stoplogs and maintain the water level in the pond below El 1034. In addition, the Owner should repair the deficiencies listed above, as described in Section 7.3. The Owner should also implement a program of annual technical inspections, a plan for surveillance of the dam during and after periods of heavy rainfall, and a plan for notifying downstream residents in the event of an emergency at the dam.

The measures outlined above and in Section 7 should be implemented by the Owner within a period of 1 year after receipt of this Phase I Inspection Report.




Edward M. Greco, P.E.
Project Manager
Metcalf & Eddy, Inc.
Massachusetts Registration
No. 29800

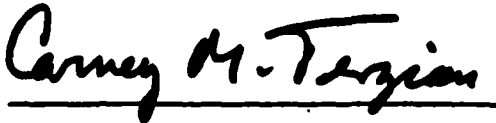
Approved by:

Stephen L. Bishop, P.E.
Vice President
Metcalf & Eddy, Inc.
Massachusetts Registration
No. 19703



This Phase I Inspection Report on White Mill Pond Dam (MA-00630) has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.



ARAMAST MAHTESIAN, MEMBER
Geotechnical Engineering Branch
Engineering Division

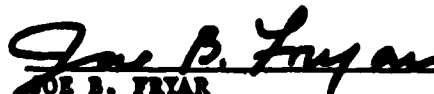


CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division



RICHARD DIBUONO, CHAIRMAN
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:



JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in Recommended Guidelines for Safety Inspection of Dams, for a Phase I Investigation. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions will be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general conditions and the downstream damage potential.

WHITE'S MILL POND DAM

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OVERVIEW
WHITES MILL POND DAM
WINCHENDON, MASSACHUSETTS



NATIONAL DAM INSPECTION
PROGRAM

PHASE I INSPECTION REPORT

WHITE'S MILL POND DAM

SECTION 1

PROJECT INFORMATION

1.1 General

- a. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Metcalf & Eddy, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Massachusetts. Contract No. DACW 33-80-C-0054, dated April 18, 1980, has been assigned by the Corps of Engineers for this work.
- b. Purpose
 - (1) Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.
 - (2) Encourage and assist the States to quickly initiate effective dam safety programs for non-Federal dams.
 - (3) Update, verify and complete the National Inventory of Dams.

1.2 Description of Project

- a. Location. The dam is located on the North branch of the Miller's River in the Town of Winchendon, Worcester County, Massachusetts (see Location Map). The coordinates of this location are Latitude 42 deg. 41.6 min. north and Longitude 72 deg. 00.7 min. west.
- b. Description of Dam and Appurtenances. White's Mill Pond Dam is a 340-foot long, earthfill dam with dry stone masonry walls upstream and downstream. The dam has a maximum height of 13 feet (see Plan of Dam and Sections in Appendix B and photographs in Appendix C). The top of

the dam is 16 feet wide and varies from El 1040.7 to 1041.5. The upstream face of the right abutment is a 2:1 (horizontal to vertical) slope covered with brush and trees. The downstream face is a stone masonry wall which is at a 1:12 batter. The upstream face of the left abutment is a partially submerged dry stone wall. The downstream face is also a dry stone masonry wall that tilts downstream at 1:6 (horizontal to vertical). There are no available drawings of the dam.

The spillway, located near the left abutment of the dam, is a 28-foot long, broad-crested concrete weir. The approach channel was submerged and could not be inspected. Wooden stoplogs 2.0 feet high are mounted in wood slots on the crest of the spillway. An additional 2.0 feet of stoplogs can be placed at this spillway.

The crest of the spillway is at El 1037.0 and the top of the stoplogs is at El 1039.0. The length of the stoplogs available for discharge is 24.0 feet.

The discharge channel below the spillway is 28 feet wide. The sides are approximately 2 feet high. The floor of the channel is unlined and slopes at 45 percent for 18 feet and then decreases to a 1 percent slope, thereafter.

The low-level outlet for the dam is a 3.2-foot wide by 1.8-foot high, stone box culvert with a slide gate, located 5 feet from the right end of the spillway. The invert of the outlet is at El 1030.4 at the downstream end. Flow into the outlet is controlled by a valve which is buried in the dam. The outlet pipe has a capacity of 70 cfs with the pond at El 1037. Flow from the outlet pipe discharges into the spillway channel.

A 3 foot high earth dike is located 60 feet southeast of the dam embankment. The dike is 140 feet long and prevents water from bypassing the dam through a shallow swale connecting to the downstream channel.

- c. Size Classification. White's Mill Pond Dam is classified in the "small" category since it has a maximum height of 13 feet and a maximum storage capacity of 272 acre-feet.
- d. Hazard Classification. There is a factory located over the stream channel about 400 feet downstream of the dam (see Figure B-1 and Photo No. 9). An assumed failure of the dam would produce a flood 16 feet deep at the factory compared to 3 feet deep prior to failure and it is possible that more than a few lives could be lost and a significant amount of property damage could occur. Accordingly, the dam has been placed in the "high" hazard category.

- e. Ownership. The dam is owned by Ray Plastics, Inc., Glen Allen Street, Winchendon, Massachusetts 01475 (zip). Mr. Jerry LeClere (telephone 617-297-0088) granted permission to enter the property and inspect the dam.
- f. Operator. The dam is operated by personnel from Ray-Plastics, Inc.
- g. Purpose of the Dam. The water in White's Mill Pond is used for industrial cooling and fire protection by Ray-Plastics, Inc.
- h. Design and Construction. Construction of White's Mill Pond Dam was completed before 1923. No drawings or specifications are available.

Previous inspection reports indicate that since construction the dam has been in fair condition. Repairs have been made such as repair of the slide gate to low level outlet.

- i. Normal Operating Procedures. Personnel from Ray Plastics Inc. reportedly visit the dam once a day. At that time, they observe the water level and adjust stoplogs accordingly. The stoplogs are operated manually to maintain a minimum pond elevation of 1038 for the cooling water intake. The low-level outlet was last operated in 1964 when the pond was lowered to repair the slide gate.

1.3 Pertinent Data

- a. Drainage Area. The direct drainage area is approximately 600-acres (0.94 square mile) which consists of hilly land (see Figure D-1 in Appendix). The total drainage area includes limited drainage from Lake Monomonac which is siphoned into White's Mill Pond over Mill Circle Road Dam. Lake Monomonac has a drainage area of 12,200 acres (19.1 square miles). About 12.7 percent of the direct drainage area is ponds and swamps. In general, the undeveloped portions of the drainage area consist of woodland. Moderate (residential) development occurs west of the dam in Winchendon Springs. Along the west side of the pond there is light residential development.
- b. Discharge. Discharge from White's Mill Pond Dam flows over the stoplogs, on the spillway and into an unlined discharge channel. Water also discharges from the outlet directly into the downstream discharge channel.
 - (1) Outlet: Size - 3.2 feet x 1.8 feet; Invert El. - 1030.4; capacity - 70 cfs.

WHITE'S MILL POND DAM

- (2) Maximum known flood at damsite: unknown
- (3) Ungated spillway capacity at top of dam 520 cfs at El 1040.7
- (4) Ungated spillway capacity at test flood elevation: 610 cfs at El 1041.1
- (5) Gated spillway capacity at normal pool elevation: 170 cfs at El 1040.7
- (6) Gated spillway capacity at test flood elevation: 325 cfs at El 1041.6
- (7) Total spillway capacity at test flood elevation: 610 cfs at El 1041.1
- (8) Total project discharge at test flood elevation: 680 cfs at El 1041.1

c. Elevation (feet above National Geodetic Vertical Datum of 1929 (NGVD)). A benchmark was established at El 1039 at top of the stoplog. This elevation was estimated from a United States Geological Survey (U.S.G.S.) topographic map.

- (1) Streambed at toe of dam: 1026.8
- (2) Bottom of cutoff: N/A
- (3) Maximum tailwater: unknown
- (4) Normal pool: 1037 (without stoplogs)
- (5) Full flood control pool: N/A
- (6) Spillway crest (gated): 1039
- (7) Design surcharge (Original Design): unknown
- (8) Top of dam: 1040.7
Top of dike: 1040.7
- (9) Test flood surcharge: 1041.1 (without stoplogs)

d. Reservoir (Length in feet)

- (1) Normal pool: 3,200
- (2) Flood control pool: N/A

(3) Spillway crest pool: 3,200

(4) Top of dam: 3,200

(5) Test flood pool: 3,300

e. Storage (acre-feet)

(1) Normal pool: 148

(2) Flood control pool: N/A

(3) Spillway crest pool: 148

(4) Top of dam: 272

(5) Test flood: 288

f. Reservoir Surface (acres)

*(1) Normal pool: 40

*(2) Flood-control pool: N/A

(3) Spillway crest: 40

*(4) Test flood pool: 40

*(5) Top of dam: 40

g. Dam

(1) Type: Earthfill with upstream and downstream dry stone masonry walls

(2) Length: 340 feet

(3) Height: 13 feet

(4) Top Width: 16 feet

(5) Side Slopes: stone masonry walls

(6) Zoning: unknown

(7) Impervious Core: unknown

(8) Cutoff: unknown

(9) Grout curtain: unknown

(10) Other: None

*Based on the assumption that the surface area will not significantly increase with changes in pool elevation from 1037.0 to 1041.1

Dike (if applicable)

- (1) Type: earth embankment
- (2) Length: 140 feet
- (3) Height: 3.0 feet
- (4) Top Width: 6.0 feet
- (5) Side Slopes: 2:1 (horizontal to vertical)
- (6) Zoning: unknown
- (7) Impervious core: unknown
- (8) Cutoff: unknown
- (9) Grout curtain: unknown
- (10) Other: None

h. Diversion and Regulating Tunnel N/A

i. Spillway

- (1) Type: broad crested weir
- (2) Length of weir: 28 feet
- (3) Crest elevation: 1039.0 with stoplogs, 1037.0 without stoplogs
- (4) Gates: none
- (5) Upstream channel: submerged, not visible
- (6) Downstream channel: partly submerged, clogged with trees, brush, and other debris
- (7) General: footbridge across the spillway is in poor condition.

j. Regulating Outlets

- (1) Invert El.: 1030.4 downstream
- (2) Size: 3.2 feet wide, 1.8 feet high
- (3) Description: dry stone masonry box channel

- (4) Control mechanism: slide gate - size unknown
- (5) Other: 10-inch suction pipe to plant

WHITE'S MILL POND DAM

SECTION 2
ENGINEERING DATA

- 2.1 General. No engineering data was available for this Phase I inspection because there are no drawings, specifications, or computations available from the Owner, State, or County agencies. Copies of previous inspection reports dated 1926 to 1964 prepared by Worcester County Engineering Department are included in Appendix B. The most recent inspection was conducted in 1971 by the Massachusetts Department of Public Works. A copy of that report is also given in Appendix B.

We acknowledge the assistance and cooperation of personnel from the Massachusetts Department of Environmental Quality Engineering, Division of Waterways; the Massachusetts Department of Public Works; and the Worcester County Engineers Office. In addition, we acknowledge the assistance of Mr. Jerry LeClere, of Ray Plastics, Inc., who provided information on the history and operation of the dam.

- 2.2 Construction Records. There are no construction records or as-built drawings available for the dam or appurtenances. Previous inspection reports by the Worcester County Engineering Department provided some construction information, and a summary of repairs and post-construction changes at the site.
- 2.3 Operating Records. No operating records are available, and there is no daily record kept of the elevation of the pool or rainfall at the dam site.

2.4 Evaluation

- a. Availability. There is limited engineering data available for this dam.
- b. Adequacy. The lack of detailed hydraulic, structural and construction data did not allow for a definitive review. Therefore, the evaluation of the adequacy of this dam is based on the visual inspection, past performance history, and engineering judgment.
- c. Validity. Comparison of the available information with the field survey conducted during the Phase I inspection indicates that the available information is valid.

SECTION 3
VISUAL INSPECTION

3.1 Findings

- a. General. The Phase I Inspection of the dam at White's Mill Pond was performed on May 7, 1980. A copy of the inspection checklist is included in Appendix A. Previous inspections were conducted by the Worcester County Engineering Department from 1926 to 1964, and by the Massachusetts Department of Public Works in 1971. Copies of those reports are given in Appendix B. Selected photographs taken during our visual inspection are included in Appendix C.
- b. Dam. The dam is an earthfill dam with upstream and downstream dry stone masonry walls. The structure consists of a spillway, a low level outlet, an intake to the plant and an earth dike. Evidence of seepage was noted in 4 locations at the downstream toe of the dam. The seepage rates were estimated to be from 5 to 15 gpm (see Photo No. 3). The seepage was clear at the time of the inspection.

The dry stone masonry walls both upstream and downstream are in poor condition. There are many bulges in the downstream face of both walls. The right wall is battered upstream at approximately 1 to 12 (horizontal to vertical) (see Photo No. 7). The left wall is tilting downstream at 1 to 6 (horizontal to vertical). Voids between the stones were probed as far back as 6 feet into the dam (see Photo No. 5). The stone wall on the upstream left side is vertical and is intact. Riprap was visible only for the first 60 feet to the right of the spillway on the upstream slope.

The top of the dam is unpaved and curves upstream. A footpath has been worn along the center of the crest. There is a heavy growth of brush and trees 4 inches to 1 foot in diameter (see Photo No. 2) on the upstream and downstream face of the dam. The low point on top of the dam is located approximately 160 feet north of the spillway. The visual inspection revealed erosion across the dam at this point indicating that the dam may have been overtopped.

- c. Appurtenant Structures. The spillway is a 28 foot long broad crested weir with stoplogs. At the time of the inspection, water was discharging over the spillway, so the weir, stoplogs, and downstream toe could not be examined. The concrete on the crest of the spillway was

submerged and could not be inspected. The walkway over the spillway is of wood construction that is heavily weathered and rotting in places. It is situated directly over the stoplogs. The structure is braced against overturning by 2 timber beams (see Photo No. 1). The structure is leaning slightly downstream. At the time of the visual inspection the stoplogs were 2 feet above the crest of the spillway.

The upstream opening to the low level outlet was submerged and was not visible for inspection. Also, the stem to the gate controlling the outlet had been buried in the dam as a precaution against vandalism and the gate was not accessible for inspection. Reportedly the gate has not been operated since 1964 when it was last repaired. The opening at the discharge end of the low level outlet is a 1.8 foot by 3.2 foot stone box culvert which discharges directly at the toe of the dam (see Photo No. 5). Water discharging from the low level outlet flows directly into the downstream channel. At the time of the visual inspection seepage was leaking from the roof of the outlet at approximately 2 gpm. The floor of the outlet was submerged and it was not possible to determine if there was additional seepage from the outlet.

The intake to the plant is located in the northwestern corner of the pond. It consists of a 10 inch diameter suction line housed in a 4 foot wide by 8 foot long concrete chamber that is 8 feet deep. Two trash screens are located at the entrance to the chamber. Water is siphoned to the plant and according to the Owner's representative it is necessary to keep the water level in the pond at El 1038 in order to maintain the siphon. The water is used for cooling in the plant and for fire protection (see Photo No. 4).

A 3-foot high earth dike is located 60 feet southeast of the eastern dam embankment. The dike is 140 feet long and is heavily overgrown with brush and trees up to 1.5 feet in diameter (see Photo No. 10). The dike prevents water from bypassing the dam through a shallow swale connecting to the downstream channel. The upstream and downstream slopes are approximately 2:1 (horizontal to vertical) and are unprotected. They are in fair condition with moderate erosion having occurred.

- d. Reservoir Area. The reservoir area is moderately developed. The town of Winchendon Springs is located west of the dam.

Residential development is located on the west and north sides of the reservoir. Most of the land is wooded with gentle slopes. There is a small potential that future development will occur in the pond area.

- e. Downstream Channel. Both the spillway and the low level outlet discharge into the downstream channel. The floor and walls of the channel are unlined. There is a substantial accumulation of logs and uprooted trees in the floor of the stream channel (see Photograph No. 6).

Vegetation including trees is growing on the dam and is overhanging the walls of the channel (see Photograph No. 7).

A bridge extends across the discharge channel about 300 feet downstream of the dam. The bridge opening is 8.5 feet high by 16.5 feet wide which restricts the flow from the dam.

Water then flows under the Ray Plastics plant located 97 feet further downstream. The opening of this stone walled channel is 16 feet wide and 6.8 feet high. Beyond the plant the stream flows 1.3 miles to Whitney Pond.

- 3.2 Evaluation. The visual inspection indicates that the dam is in poor condition. There are numerous deficiencies which must be corrected to assure the continued performance of this dam. Measures to improve this condition are stated in Section 7.3.

SECTION 4
OPERATING AND MAINTENANCE
PROCEDURES

4.1 Operating Procedures

- a. General. According to Mr. LeClere representing Ray-Plastics, Inc., the standard procedure for operating the dam is to maintain a minimum water level of about El. 1038 by regulating the stoplogs to maintain the siphon in the 10-inch plant intake line.
- b. Warning System. There is no warning system in effect at this dam.

4.2 Maintenance Procedures

- a. General. The dam is generally poorly maintained. Ray Plastics, Inc. who is responsible for maintenance of the facility reportedly conducts periodic inspections. Typical maintenance procedures have included clearing debris from the screen at the plant intake.
- b. Operating Facilities. Maintenance of the operating facilities at the dam consists of replacing the stoplogs when they start to deteriorate. In 1964, the slide gate for the low level outlet was repaired. The operating condition of the outlet works is not checked by the Owner.

- 4.3 Evaluation. There are no regular programs of maintenance or technical inspections at the dam. There are also no plans for surveillance of the dam during periods of heavy rainfall, or for warning people in downstream areas in the event of an emergency at the dam. The lack of standard operating and maintenance procedures is undesirable, considering that the dam is in the "high" hazard category. These programs should be implemented as recommended in Section 7.3.

SECTION 5

EVALUATION OF HYDRAULIC/ HYDROLOGIC FEATURES

- 5.1 General. White's Mill Pond Dam has a direct drainage area of 0.94 square miles, about 12.7 percent of which is ponds and swamps (see Figure D-1, Drainage Area Map). The land is hilly and lightly developed. White's Mill Pond is separated from Lake Monomonac by the Springville Dam and by the Mill Circle Road Dam, which has a crest elevation at 1053.5. A 30-inch siphon diverts about 100 cfs of water from the lake to White's Mill Pond under average conditions. Under test flood flows Lake Monomonac would discharge a more significant flow to White's Mill Pond. It is assumed that the Mill Circle Road Dam, although overtopped by the test flood inflow, does not fail.

White's Mill Pond has a surface area of approximately 40 acres, and a maximum storage capacity of 272 acre-feet at El 1040.7.

The spillway consists of a stone masonry broad crested weir and discharge channel. The crest of the weir is 28 feet long and at El 1037. Stoplogs at a crest of El 1039 were noted at the time of the inspection. Discharge is through six 4 foot wide bays.

The low level outlet is a gated 3.2 by 1.8 foot stone conduit located just to the right of the spillway. The gate has not been operated since it was last repaired 16 years ago according to the owner.

The low-level outlet can discharge a flow of about 70 cfs when the pond is at El 1037.0 which is the crest of the spillway. At this pond elevation and with no additional inflow, the outlet can lower the pond by 1 foot in about 7 hours.

- 5.2 Design Data. There are no hydraulic or hydrologic computations available for the design of the spillway at White's Mill Pond Dam.
- 5.3 Experience Data. There is no record of overtopping of the present dam. The Owner stated that according to the previous owners, during the 1938 hurricane, the dam was not overtopped. It must be pointed out however, that the visual inspection indicated evidence that the dam may have been overtopped at the low point on the dam.

5.4 Test Flood Analysis. White's Mill Pond has been classified in the "small" size and "high" hazard categories according to the Corps of Engineers guidelines. The guidelines recommend that for dams in these categories, a test flood between the 1/2 PMF (probable maximum flood) and the full PMF should be used to evaluate the capacity of the spillway. Based on the reservoir storage and the number of structures located downstream, the 1/2 PMF was selected as the test flood.

The PMF rate for the watershed contributing directly to White's Mill Pond watershed was calculated to be 1800 cfs per square mile of drainage area. This calculation is based on the average slope of 3.5 percent in the drainage area, the pond-plus-swamp area to drainage area ratio of 12.7 percent, and the U.S. Army Corps of Engineers' guide curves for Maximum Probable Flood Peak Flow Rates (dated December 1977). For this analysis, the peak flow rate was determined to be between "rolling" and "flat and coastal".

Applying the 1/2 PMF rate to the 0.94 square mile drainage area results in a peak test flood inflow of 846 cfs. Additional inflow from Lake Monomonac through the siphon was estimated to be 110 cfs for a total test flood inflow of 956 cfs. By adjusting the test flood inflow for surcharge storage, the peak test flood outflow was calculated to be 680 cfs (723 cfs per square mile).

Without stoplogs, the pond level would rise to El 1041.1 during the test flood. With stoplogs, the pond would rise to El 1041.6. Both elevations result in overtopping the dam.

Hydraulic analyses indicate that the spillway without stoplogs can discharge 520 cfs or 76 percent of the test flood outflow with the pond at El 1040.7, which is the low point on the top of the dam. With stoplogs, the spillway could discharge 170 cfs, or 22 percent of the outflow before the dam is overtopped.

Table 5-1 below summarizes the discharge from the pond during the test flood.

TABLE 5-1.

	Stoplogs/ in place	Stoplogs removed
Maximum height of water above dam, ft:	0.9	0.5
Discharge over spillway, cfs:	170	520
Discharge over dam, cfs:	867	306
Critical depth at low point on crest, ft:	0.6	0.3
Critical velocity low point on crest, fps:	4.3	3.1

- 5.5 Dam Failure Analysis. Hydraulic calculations indicate that the spillway, with the stoplogs at El 1039.0, can discharge 170 cfs with the pond at El 1040.7 which is the low point on the dam. This amount of flow will produce a backwater about 3 feet high in the channel at the factory. Failure of the dam at maximum flow would produce a downstream flow of 3,270 cfs which would cause the backwater to rise an additional 13 feet at the factory to El 1033.1 (see Photo No. 9 and Drawing F-F on B-2). It would take about 2 hours to drain the pond.

There are several homes located along the channel downstream of the factory. The foundations of these structures are approximately 5 feet above the floor of the channel. Discharge due to failure of the dam would flow under and around the factory. It is likely that failure of the dam would result in excessive property damage at the factory and downstream and loss of more than a few lives. Accordingly, the dam has been placed in the "high" hazard category.

SECTION 6
STRUCTURAL STABILITY

- 6.1 Visual Observations. The evaluation of the structural stability of White's Mill Pond Dam is based on a review of previous inspection reports, and the visual inspection conducted on May 7, 1980.

As discussed in Section 3, Visual Inspection, the dam is in poor condition. Severe seepage was observed along the toe of the embankment in four locations. Movement of the dam is indicated by tilting downstream of the dry stone masonry wall on the left side of the dam. Areas of erosion were observed on the top of the right hand embankment. A thick growth of trees and vegetation exists on the top of the dam and dike.

- 6.2 Design and Construction Data. Construction of White's Mill Pond Dam was completed before 1923. Computations for design of the dam, spillway and outlet are not available.

Specifications for construction of the dam are also not available.

There is no information on the shear strength or permeability of the soil or rock materials of the embankment.

- 6.3 Post-Construction Changes. Since the original construction of the dam, the only known repair that has been made is to the low level outlet slide gate in 1964.

- 6.4 Seismic Stability. The dam is located in Seismic Zone No. 2, and in accordance with Corps of Engineers' guidelines does not warrant further seismic analysis at this time.

SECTION 7

ASSESSMENT, RECOMMENDATIONS, AND REMEDIAL MEASURES

7.1 Dam Assessment

- a. Condition. As a result of the visual inspection, the review of available data, and limited information on operation and maintenance, the dam is considered to be in poor condition. The following deficiencies must be corrected to assure the continued performance of this dam: severe seepage along the toe of the embankment; tilting of the dry stone masonry wall on the left side of the dam; erosion on the top of the upstream embankment; cracked and missing mortar, and missing stones on the masonry walls of the spillway; a deteriorated bridge and stop log structure, a heavy growth of trees and brush on the dam and dike and accumulation of debris in the downstream channel.

The slide gate operator for the low level outlet is located within the dam, and is operated through a gate box on the crest of the dam near the spillway.

The peak test flood (1/2 PMF) outflow is estimated to be 680 cfs with the pond at El 1041.1 (assuming the stoplogs are released). The test flood would overtop the low point on the dam by 0.5 feet. Hydraulic analyses indicate that the spillway (without stoplogs) can discharge 520 cfs or 76 percent of the test flood outflow before the dam is overtopped. (With the stoplogs in place, the spillway can discharge 170 cfs or 22 percent of the test flood outflow before the dam is overtopped).

- b. Adequacy. The lack of detailed design and construction data did not allow for a definitive review. Therefore, the evaluation of this dam is based on a review of the available data, the visual inspection, past performance and engineering judgment.
- c. Urgency. The recommendations and remedial measures outlined below should be implemented by the Owner within 1 year after receipt of this Phase I Inspection Report except for recommendation 7.2.b. which should be implemented immediately upon receipt of this report.

7.2 Recommendations. It is recommended that the Owner employ a qualified registered engineer to:

WHITE'S MILL POND DAM

- a. Develop procedures to clear trees, brush and roots from the dam and dike embankment, and to a distance of 25 feet from the toe of the dam and dike. All stumps and roots removed should be backfilled with select material.
- b. Evaluate the stability of the dam and spillway including an investigation of the severe seepage noted at the toe of the dam. This should include an inspection of the spillway under a no flow condition. The investigation should be conducted after the embankment is cleared of brush.
- c. Perform a detailed hydrologic/hydraulic analysis to evaluate the discharge capability of the spillway and the overtopping potential of the dam. In the analysis, consideration should be given to the effect of failure of Mill Circle Road Dam and Springville Dam would have on White's Mill Pond.
- d. Until the recommendations resulting from these investigations are implemented, the Owner should immediately remove the flashboards and maintain the water level in the pond below El 1034. This may require that the Owner install pumping facilities to provide water to the facility.

The Owner should implement the recommendations of the Engineer.

7.3 Remedial Measures

- a. Operating and Maintenance Procedures. It is recommended that the Owner accomplish the following:
 - (1) Fill in eroded areas on the upstream and downstream face of the earth embankment portions of the dam.
 - (2) Replace missing or cracked mortar and missing stones in the stone masonry wall at the spillway.
 - (3) Uncover the operating mechanism on the outlet and restore it to working condition.
 - (4) Replace missing riprap on the upstream face of the embankment.
 - (5) Remove all brush, trees, debris and loose stone in the floor of the spillway discharge channel.
 - (6) Institute a definite plan for surveillance of the dam and spillway during and after periods of heavy rainfall and a plan to warn people in downstream areas in the event of an emergency at the dam.

(7) Implement a systematic program of maintenance inspections. As a minimum, the inspection program should consist of a monthly inspection of the dam and appurtenances and be supplemented by additional inspections during and after severe storms. All repairs and maintenance should be undertaken in compliance with all applicable State regulations. The maintenance program should include removal of any debris caught on the spillway weir to prevent clogging of the spillway.

(8) Institute a program of technical inspections of this dam on an annual basis.

7.4 Alternatives. The alternative to implementing the recommendations and remedial measures listed above would be to drain the pond and remove the dam.

APPENDIX A
PERIODIC INSPECTION CHECKLIST

WHITE'S MILL POND DAM

PERIODIC INSPECTION

PARTY ORGANIZATION

PROJECT WHITE'S MILL POND DAM

DATE May 7, 1980

TIME 8:30A.M.-2:30P.M.

WEATHER Cloudy, Showers

W.S. ELEV. 1039.4 U.S. 1019.4 D.N.S.

PARTY:

1. M. Gilbert (Metcalf & Eddy, Inc. - Geotechnical)
2. S. Nagel (Metcalf & Eddy, Inc. - Geotechnical)
3. W. Checchi (Metcalf & Eddy, Inc. - Geotechnical)
4. W. Diesl (Metcalf & Eddy, Inc. - Geotechnical)
5. L. Branagan (Metcalf & Eddy, Inc. - Hydraulics)

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Dam Embankment	M. Gilbert/S. Nagel	
2.	Intake-Outlet Works	L. Branagan	
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

PERIODIC INSPECTION CHECK LIST

PROJECT WHITE'S MILL POND DAM DATE May 7, 1980

PROJECT FEATURE Dam Embankment NAME M. Gilbert

DISCIPLINE Geotechnical NAME S. Nagel

u/s = upstream d/s = downstr.

AREA EVALUATED	CONDITIONS
<u>DAM EMBANKMENT</u>	
Crest Elevation	1041.1
Current Pool Elevation	1039.4
Maximum Impoundment to Date	Unknown
Surface Cracks	Dirt footpath, - no cracks
Pavement Condition	None
Movement or Settlement of Crest	Small area that is a low spot, it looks like it has overtopped in this spot
Lateral Movement	RH side about 25 from spillway the d/s rock wall has a 6:1 (VtoH) batter downstream
Vertical Alignment	Relatively flat
Horizontal Alignment	Curved u/s (bulg-)
Condition at Abutment and at Concrete Structures	Fair, LH abutment into natural grd. RH abut. into parking area
Indications of Movement of Structural Items on Slopes	Dry stone masonry wall to left of spillway is tilted d/s
Trespassing on Slopes	Footpath with little or no veg. in middle heavy brush and trees on side of crest*
Sloughing or Erosion of Slopes or Abutments	u/s on LH side of dam small localized area where it appears that dam was overtopped
Rock Slope Protection - Riprap Failures	d/s rock has 12:1 (Vto H) u/s batter voids probed ~ 4 ft.
Unusual Movement or Cracking at or near Toes	Severe bulge in wall
Unusual Embankment or Downstream Seepage	RH side 3 areas of seepage 1 @15gpm* and 2 @ <5gpm LH side 1 area @ <5 gpm
Piping or Boils	None noticed seepage is clear
Foundation Drainage Features	None
Toe Drains	None
Instrumentation System	None

*And On the embankment

PERIODIC INSPECTION CHECK LIST

PROJECT WHITE'S MILL POND DAM

DATE May 7, 1980

PROJECT FEATURE Dike Embankment

NAME M. Gilbert

DISCIPLINE Geotechnical

NAME S. Nagel

AREA EVALUATED	CONDITION
<u>DIKE EMBANKMENT</u>	
Crest Elevation	1041.1
Current Pool Elevation	1039.4
Maximum Impoundment to Date	-
Surface Cracks	Earth embankment no cracks observed
Pavement Condition	None
Movement or Settlement of Crest	Level
Lateral Movement	None visible
Vertical Alignment	Relatively flat
Horizontal Alignment	Curved d/s (bulged)
Condition at Abutment and at Concrete Structures	LH wet RH @ spillway-OK
Indications of Movement of Structural Items on Slopes	None
Trespassing on Slopes	Footpath, many trees and brush on u/s & d/s slopes
Sloughing or Erosion of Slopes or Abutments	None
Rock Slope Protection - Riprap Failures	No riprap protection on u/s slope
Unusual Movement or Cracking at or near Toes	None visible
Unusual Embankment or Downstream Seepage	None
Piping or Boils	None
Foundation Drainage Features	None
Toe Drains	None
Instrumentation System	None

PERIODIC INSPECTION CHECK LIST

PROJECT WHITE'S MILL POND DAM

DATE May 7, 1980

PROJECT FEATURE Outlet Works

NAME M. Gilbert

DISCIPLINE Geotechnical

NAME S. Nagel

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL</u>	
<u>General Condition of Concrete</u>	
<u>Rust or Staining</u>	
<u>Spalling</u>	
<u>Erosion or Cavitation</u>	
<u>Visible Reinforcing</u>	
<u>Any Seepage or Efflorescence</u>	
<u>Condition at Joints</u>	
<u>Drain Holes</u>	
<u>Channel</u>	
<u>Loose Rock or Trees Over- hanging Channel</u>	Tree growing out of rock wall on d/s slope overhangs both spillway and low level outlet.
<u>Condition of Discharge Channel</u>	

Low level outlet is a rock lined box culvert with a hand operated slide gate. Gate box is located on crest of dam near the spillway. The gate valve was last repaired and operated 9 years ago. Discharge is onto a boulder which is about 5 ft. to the right of the spillway. This discharge joins the spillway overflow at that point.

PERIODIC INSPECTION CHECK LIST

PROJECT WHITE'S MILL POND DAM

DATE May 7, 1980

PROJECT FEATURE Outlet Works

NAME M. Gilbert

DISCIPLINE Geotechnical

NAME S. Nagel

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS</u>	
a. Approach Channel	
General Condition	Fair
Loose Rock Overhanging Channel	No
Trees Overhanging Channel	1 bush in wall
Floor of Approach Channel	Submerged
b. Weir and Training Walls	
General Condition of Concrete	Rock w/concreted joints, corner stone missing on LH side, cracking on both sides - FAIR to POOR
Rust or Staining	No
Spalling	At water line
Any Visible Reinforcing	None
Any Seepage or Efflorescence	None
Drain Holes	None
c. Discharge Channel	
General Condition	Fair
Loose Rock Overhanging Channel	No, about 1 ft. of water flowing over spillway
Trees Overhanging Channel	Many overhanging and in channel
Floor of Channel	Boulders
Other Obstructions	Logs and fallen tree w/roots in channel

Footbridge over spillway is leaning d/s. It is of wood construction which is in poor condition.

Stop logs within 2 ft. of top are in place on u/s side of footbridge. Stop logs are in good condition.

PERIODIC INSPECTION CHECK LIST

PROJECT WHITE'S MILL POND DAM DATE May 7, 1980
 PROJECT FEATURE Outlet Works NAME M. Gilbert
 DISCIPLINE Geotechnical NAME S. Nagel

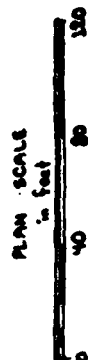
AREA EVALUATED	CONDITION
<u>OUTLET WORKS - TRANSITION AND CONDUIT</u>	
General Condition of Concrete	
Rust or Staining on Concrete	
Spalling	
Erosion or Cavitation	
Cracking	
Alignment of Monoliths	
Alignment of Joints	
Numbering of Monoliths	

Service intake to factory is a screened intake with a 10" line which feeds a 10" line to the fire pump and a 6" line used for cooling water in the factory. The 6" service line requires a minimum pond elevation of about 1038.0 to service pump. The line is a siphon.

APPENDIX B
PLANS OF DAM AND PREVIOUS
INSPECTION REPORTS

	<u>Page</u>
Figure B-1, Plan of Dam	B-1
Figure B-2, Sections through Dam	B-2
File card for White's Mill Dam from Worcester County Engineer's Office	B-3
Previous Inspection Reports Dated 1926 through 1964 by Worcester County Engineer's Office	B-4
Dated December 27, 1971 by Massachusetts Department of Public Works	B-26

WHITE'S MILL POND DAM



WHITES MILL POND
WATER SURFACE ELEVATION = 1029.4

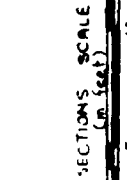
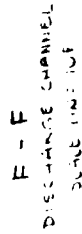
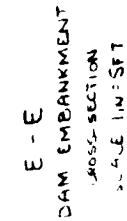
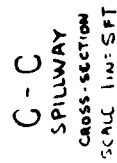
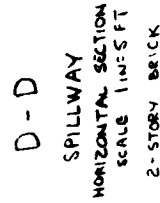
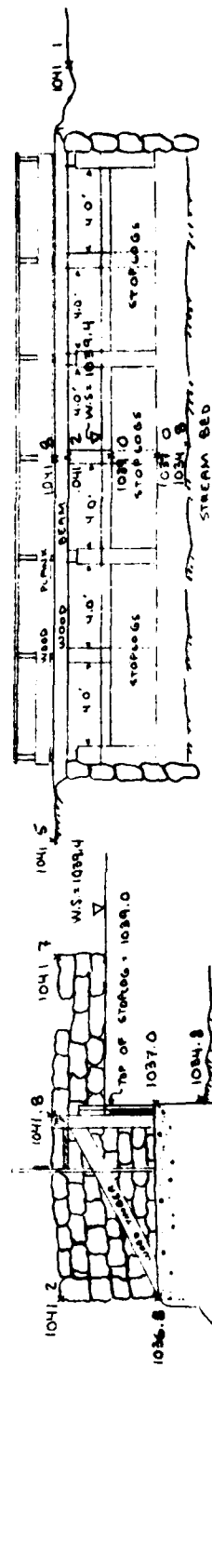
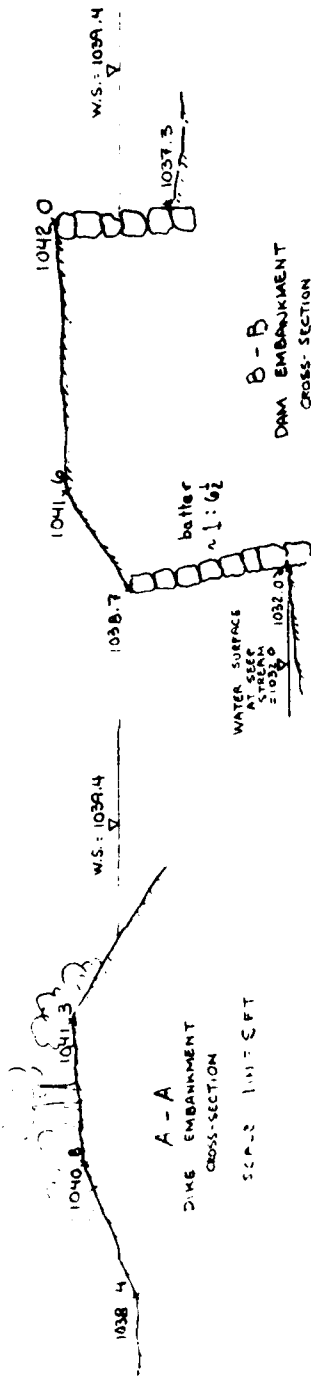
PLAN SCALE

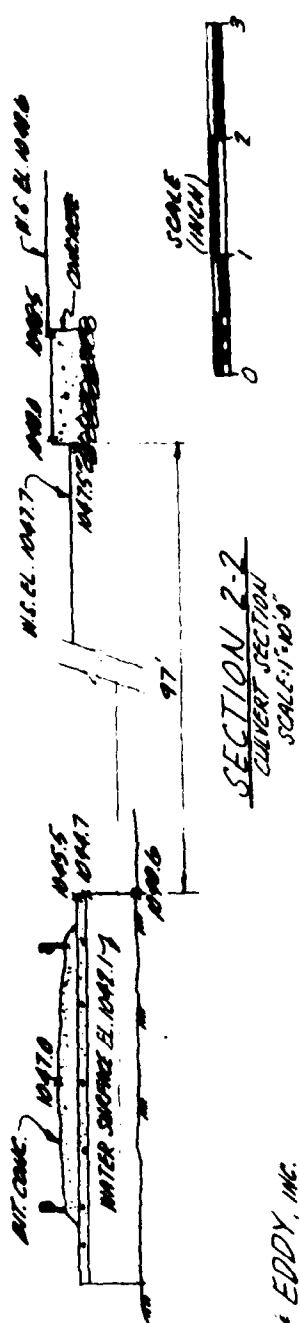
120 30 30 120

METCALF & EDDY TWO

NOTES:

1. ELEVATIONS SHOWN BASED ON ASSUMED
TOP OF STOPLOG ELEVATION 1039 (MGVD)
2. ELEVATIONS SHOWN ON WINCHENDON QUADRANGLE
SHEET.
3. INFORMATION SHOWN BASED ON FIELD
SURVEY OF 7 MAY 1980.
4. DROTES SLEEPAGE.
5. 2 INDICATES LOCATION AND DIRECTION
OF VIEW FOR PHOTOGRAPHS
6. SEE FIGURE B-2 FOR SECTIONS THROUGH
DAM.





METCALF: EDDY, INC.

DATE: 6-10-01

DESCRIPTION OF DAM

DESCRIPTION OF RESERVOIR & WATERSHED

Name of Main Stream	
" " any other Streams	
Length of Watershed	
Width "	
Is Watershed Cultivated	
Percent in Forest	
Steepness of Slope	
Kind of Soil	0.97
No. of Acres in Watershed	21.59 Miles
" " " Reservoir	
Length of Reservoir	
Width "	
Max Flow Cu. Ft. per Sec.	
Head or Flashboards-Low Water	21' Ave Head
" " " High "	

~~Year Constructed~~ PA 3-1983 LOM LCF-Measured at S 27?

GENERAL REMARKS

1938 - Owned by White Bros. Inc.
Second Inspection 3-23-20 L.O. Morden
Inspected: Sept. 26, 1945 - L.O. M. E.
July 8, 1948
May 16, 1952 L.O. M.
Dec. 12 1951 - L.O. M.

Decree No.

Dam No. 60-01

COUNTY OF WORCESTER, MASSACHUSETTS
OFFICE OF COUNTY ENGINEER

Neg. Nos.

INSPECTION OF DAMS, RESERVOIR DAMS AND RESERVOIRS

Town Winchendon Date March 29, 1926 Dam No.

Location Springfield Name of Pond or Stream Mill Pond-

Inspected by L.O. Karden

Owner H.D. White & Sons Use Power & Washing.

MATERIAL & TYPE see first inspection report.

Elevations in feet: above (+) or below (-) full pond or reservoir level.

FOR DAM Bed of stream below top of spillway

FOR RESERVOIR

top of dam top of flashboards ground surface below

level of overflow pipe length in feet

width top in feet width bottom in feet size pipe to mill

inches length spillway in feet head in feet

Size of wheel H. P. developed

Size of gates location of gates

Foundation and details of construction

condition of embankment

Constructed by date

Designed by location

Recent repairs and date none.

Evidence of leakage leaks shown in first report from old waste gate-

Condition fair to good-

Topography of country below

Nature of buildings and roads below dam

No. Acres in watershed No. Acres in pond

Plans secured Percent watershed in cultivation

Percent in forests Note: Cross out word not applicable

Decree No.

Dam No. 60-01

COUNTY OF WORCESTER, MASSACHUSETTS
OFFICE OF COUNTY ENGINEER

Neg. Nos.

INSPECTION OF DAMS, RESERVOIR DAMS AND RESERVOIRS

Town Winchendon Date Dec. 14, 1927 Dam No. 60-01

Location at Winchendon Sprgs Name of Pond or Stream White Mill Pond.

Inspected by L.O. Marden from Lake Mononomac.

Owner N.D. White & Sons. Use Power and washing.

MATERIAL & TYPE

Elevations in feet: above (+) or below (-) full pond or reservoir level.

FOR DAM Bed of stream below top of spillway

FOR RESERVOIR

top of dam top of flashboards 24 inches ground surface below

level of overflow pipe length in feet

width top in feet width bottom in feet size pipe to mill

inches length spillway in feet head in feet

Size of wheel H. P. developed

Size of gates location of gates

Foundation and details of construction

condition of embankment fair to good.

Constructed by date

Designed by location

Recent repairs and date old

Evidence of leakage thru gates west of spillway abt. 5' not dangerous

Condition fair to good.

Topography of country below

Nature of buildings and roads below dam

No. Acres in watershed No. Acres in pond

Plans secured Percent watershed in cultivation

Percent in forests Note: Cross out word not applicable

steel stem to above gate sticks up so can be opened.

COUNTY OF WORCESTER MASSACHUSETTS
COUNTY ENGINEER

Inspection of Dams, Reservoir Dams, and Reservoirs.

Inspected by L. O. Marden Date 10-13-29 Dam No. 60-01

Town Winchendon Location above mill

Owner N. D. White & Sons Use

Material and Type

Dam Designed by Constructed by Year

SPILLWAY

El. top Abutment El. Crest El. Apron El. Streambed

Width top Abutment Width top Crest Width bottom Spillway

Width Flashboards carried Kind Flashboards

El. Flowline Cleanout Pipe Size and Kind Cleanout Pipe

Kind of Foundation under Spillway

Condition O.K. except west abutment wall should be recemented-slight
settlement- same with east wall

EMBANKMENT

El. Top El. Natural Ground Width Top

Width of Bottom Upstream Slope Downstream Slope

Kind of Corewall Riprap

Material in Embankment Foundation

Condition cut brush out of crevices in embankment walls. cut white
birch out wall lower side west abt. spillway

GATES Location

Size Kind El. Flowline

Condition O.K.

WHEEL Kind Size Rated H. P.

Location Ave. Head

Evidence of Leaks in Structure leaks in two places- one beside stone buttress
to west of gate and 6-6' distant from buttress- also 16'- also 22'
also 40'

Recent Repairs and Date

Topography of Country below Dam

Nature of Buildings and Roads below Dam

Number Acres in Pond Drainage Area in Square Miles

Discharge in Second Feet per Square Mile

Estimated Storage Million Cubic Feet

COUNTY OF WORCESTER MASSACHUSETTS

COUNTY ENGINEER

Inspection of Dams, Reservoir Dams, and Reservoirs.

Inspected by L. O. Marden Date Feb. 13, 1932 Dam No. 60-01

Town Winchendon Location

Owner N. D. White & Son. Use

Material and Type

Dam Designed by Constructed by Year

SPILLWAY—Length Feet. Depth Feet

El. top Abutment El. Crest El. Apron El. Streambed

Width top Abutment Width top Crest Width bottom Spillway

Width Flashboards carried Kind Flashboards

El. Flowline Cleanout Pipe Size and Kind Cleanout Pipe

Kind of Foundation under Spillway

Condition O. K.

EMBANKMENT—Length overall Feet

El. Top El. Natural Ground Width Top

Width of Bottom Upstream Slope Downstream Slope

Kind of Corewall Riprap

Material in Embankment Foundation

Condition O. K.

GATES Location

Size Kind El. Flowline

Condition

WHEEL Kind Size Rated H. P.

Location Ave. Head

Evidence of Leaks in Structure

Recent Repairs and Date

Topography of Country below Dam

Nature of Buildings and Roads below Dam

Number of Acres in Pond Drainage Area in Square Miles

Discharge in Second Feet per Square Mile

Estimated Storage Million Cubic Feet

COUNTY OF WORCESTER MASSACHUSETTS

COUNTY ENGINEER

Inspection of Dams, Reservoir Dams, and Reservoirs.

Sept. 24 '36

6003

Inspected by W. O. L., M. F. H.

Date 3/20/36

Dam No. 6001-6002-

Town Winchendon

Location

Owner

Use

Material and Type

Dam Designed by

Constructed by

Year

SPILLWAY—Length Feet. Depth Feet

El. top Abutment

El. Crest

El. Apron

El. Streambed

Width top Abutment

Width top Crest

Width bottom Spillway

Width Flashboards carried

Kind Flashboards

El. Flowline Cleanout Pipe

Size and Kind Cleanout Pipe

Kind of Foundation under Spillway

Condition #60-01 looks OK from rd. People living there said that all 3 of these dams were OK and no water went over embankments.

EMBANKMENT—Length overall Feet

El. Top

El. Natural Ground

Width Top

Width of Bottom

Upstream Slope

Downstream Slope

Kind of Corewall

Riprap

Material in Embankment

Foundation

Condition

GATES

Location

Size

Kind

El. Flowline

Condition

WHEEL

Kind

Size

Rated H. P.

Location

Ave. Head

Evidence of Leaks in Structure

Recent Repairs and Date

Topography of Country below Dam

Nature of Buildings and Roads below Dam

Number of Acres in Pond

Drainage Area in Square Miles

Discharge in Second Feet per Square Mile

Estimated Storage Million Cubic Feet

WORCESTER COUNTY ENGINEER

Inspection of Dams, Reservoir Dams, and Reservoirs

Inspected by M. F. Hunt Date 10-14-38 Dam No. 60-01
.....

Town Winchendon Location Above N. D. White Mills
Owner N. D. White Co. Use _____

SPILLWAY 7 -3' sections 3'-10" high
El.top Abutment _____ El.Crest _____ El.Apron _____ El.St.Bed _____
Width top Abut. _____ Width top Crest _____ Width bottom Sp.way _____
Width flashboards _____ Kind Flashboards _____
El.Flowline Cleanout Pipe _____ Size and Kind Pipe _____
Kind of Foundation under Spillway _____
Condition OK

EMBANKMENT
El.Top _____ El.Natural Ground _____ Width Top _____
Width of Bottom _____ Upstream Slope _____ Downstream Slope _____
Kind of Corewall _____ Riprap _____
Material in Embankment _____ Foundation _____
Condition Water was held back at Lake Monomomac Dam so that very little water came down

GATES _____ Location _____
Size _____ Kind _____ El.Flowline _____
Condition This dam is all right only if all flood water is held back at the main dam. The embankment is too low and the spillway too small otherwise.

Evidence of Leaks in Structure _____
Small leak thru wall, south end (old one)

Recent Repairs and Date _____

Number Acres in Pond _____ Drainage Area in Sq.Miles _____
Discharge in Second Feet per Square Mile _____
Estimated Storage Million Cubic Feet _____

WORCESTER COUNTY ENGINEER

Inspection of Dams, Reservoir Dams, and Reservoirs

Inspected by E. S. Moore Date 1-7-39 Dam No. 60-01
 12:45 P.M.

Town Witchendon Location W. Springs off Rte 202 & 32
 Owner White Use _____

SPILLWAY

El. top Abutment _____ El. Crest _____ El. Apron _____ El. St. Bed _____
 Width top Abut. _____ Width top Crest _____ Width bottom Sp. way _____
 Width flashboards _____ Kind Flashboards _____
 El. Flowline Cleanout Pipe _____ Size and Kind Pipe _____
 Kind of Foundation under Spillway _____
 Condition Water lower abt 2' below mud sill
Snow covered ground pond side of dam Still Raining heavy mist

EMBANKMENT

El. Top _____ El. Natural Ground _____ Width Top _____
 Width of Bottom _____ Upstream Slope _____ Downstream Slope _____
 Kind of Corewall _____ Riprap _____
 Material in Embankment _____ Foundation _____
 Condition _____

GATES

Location _____
 Size _____ Kind _____ El. Flowline _____
 Condition _____

Evidence of Leaks in Structure _____

Recent Repairs and Date _____

Number Acres in Pond _____ Drainage Area in Sq. Miles _____

Discharge in Second Feet per Square Mile _____

Estimated Storage Million Cubic Feet _____

WORCESTER COUNTY ENGINEER

Inspection of Dams, Reservoir Dams, and Reservoirs

Inspected by E. S. Grover Date Mar-16-1939 Dam No. 60-01

Town Winchendon Location Miller's River

Owner N. D. White Use _____

SPILLWAY

El. top abutment _____ El. Crest _____ El. Apron _____ El. St. Bed _____

Width top Abut. _____ Width top Crest _____ Width bottom Sp. way _____

Width flashboards _____ Kind Flashboards _____

El. Flowline Cleanout Pipe _____ Size and Kind Pipe _____

Kind of Foundation under Spillway _____

Condition Top of Flashboards 27" above CREST

6 of the 7 widths of flashboards Water Level flush
1 widths lower and 3/4" of water going over

EMBANKMENT

El. Top _____ El. Natural Ground _____ Width Top _____

Width of Borrom _____ Upstream Slope _____ Downstream Slope _____

Kind of Corewall _____ Piprap _____

Material in Embankment _____ Foundation _____

Condition _____

GATES

Location _____

Size _____ Kind _____ El. Flowline _____

Condition _____

Evidence of Leaks in Structure _____

Recent Repairs and Date _____

Number Acres in Pond _____ Drainage Area in Sq. Miles _____

Discharge in Second Feet per Square Mile _____

Estimated Storage Million Cubic Feet _____

COUNTY OF WORCESTER MASSACHUSETTS
COUNTY ENGINEER

Inspection of Dams, Reservoir Dams, and Reservoirs.

Inspected by LOM M.F.H. Date 9-26-45 Dam No. 60-01

Town Winchendon Location Mill Pond

Owner N.D. White & Sons Use

Material and Type

Dam Designed by Constructed by Year

SPILLWAY

El. top Abutment El. Crest El. Apron El. Streambed

Width top Abutment Width top Crest Width bottom Spillway

Width Flashboards carried Kind Flashboards

El. Flowline Cleanout Pipe Size and Kind Cleanout Pipe

Kind of Foundation under Spillway

Condition patch planks in spillway

EMBANKMENT

El. Top El. Natural Ground Width Top

Width of Bottom Upstream Slope Downstream Slope

Kind of Corewall Riprap

Material in Embankment Foundation

Condition grab out brush & roots

GATES Location

Size Kind El. Flowline

Condition appears OK

WHEEL Kind Size Rated H. P.

Location Ave. Head

Evidence of Leaks in Structure Seepage - East End from spillway

good sized leak

Recent Repairs and Date

Topography of Country below Dam

Nature of Buildings and Roads below Dam

Number Acres in Pond Drainage Area in Square Miles

Discharge in Second Feet per Square Mile

Estimated Storage Million Cubic Feet

TOWN Winchendon

DAM NO. 60-01

LOCATION Easton Mill Pond

STREAM _____

WORCESTER COUNTY ENGINEERING DEPARTMENT
WORCESTER, MASSACHUSETTS

DAM INSPECTION REPORT

OWNED BY White Bros Inc PLACE Winchendon USE power etc

INSPECTED BY LOM DATE May 16, 1950

TYPE OF DAM Earth-Struct timber spillway CONDITION only fair.
Downstream dry supporting wall.
SPILLWAY

FLASHBOARDS IN PLACE Yes RECENT REPAIRS None

CONDITION planks - crest poor - water seeps thru stone abt walls.
also comes out in stream downstream side of abt.
REPAIRS NEEDED _____

Rehabilitate spillway.

EMBANKMENT

RECENT REPAIRS None

CONDITION Embk. covered with brush & trees

REPAIRS NEEDED cut out & grub out roots brush & trees.
Rebuild embankment.

GATES

RECENT REPAIRS None

CONDITION Fair

REPAIRS NEEDED Rebuild where necessary

LEAKS

HOW SERIOUS Some leaks and seepage - perhaps not
to dangerous

DATE May 16, 1950

L.O. Hadden
COUNTY ENGINEER

TOWN Winchendon

DAM NO. 60-01

LOCATION Factory Mill Pond

STREAM _____

WORCESTER COUNTY ENGINEERING DEPARTMENT
WORCESTER, MASSACHUSETTS

DAM INSPECTION REPORT

OWNED BY White Bros Inc PLACE Madison Spring USE Storage etc

INSPECTED BY L. O. Martin DATE July 8, 1951

TYPE OF DAM _____ CONDITION Fair

SPILLWAY

FLASHBOARDS IN PLACE None RECENT REPAIRS None

CONDITION planks open pool - water seeps thru abt walls

REPAIRS NEEDED renew planks - cut off leaks

EMBANKMENT

RECENT REPAIRS None

CONDITION covered with brush & trees - water flowing thru

REPAIRS NEEDED cut off " " " cutoff leaks

GATES

RECENT REPAIRS None

CONDITION Fair

REPAIRS NEEDED None

LEAKS

HOW SERIOUS could be

DATE _____

COUNTY ENGINEER

TOWN Winchendon

DAM NO. 60-01

LOCATION Factory Mill Pond

STREAM Millers R.

WORCESTER COUNTY ENGINEERING DEPARTMENT
WORCESTER, MASSACHUSETTS

DAM INSPECTION REPORT

OWNED BY White Bros., Inc. PLACE Winchendon USE Industrial.

INSPECTED BY LOM. DATE Dec. 12, 1951.

TYPE OF DAM Earth-stone & timber spillway CONDITION fair.

SPILLWAY

FLASHBOARDS IN PLACE stanchion boards RECENT REPAIRS none

CONDITION fair

REPAIRS NEEDED planks in poor condition-replace. Water seeps through masonry walls and comes out in stream on downstream embankment.

EMBANKMENT

RECENT REPAIRS none.

CONDITION covered with brush and trees.

REPAIRS NEEDED cut off brush and trees, grub out roots, and replace with good quality filling. Downstream slop embankment should be flattened.

GATES

RECENT REPAIRS none

CONDITION fair

REPAIRS NEEDED check timbers and place those in poor shape.

LEAKS

HOW SERIOUS

DATE

COUNTY ENGINEER

TOWN Winchendon

DAM NO. 48-01

LOCATION Winchendon Springs

STREAM _____

WORCESTER COUNTY ENGINEERING DEPARTMENT
WORCESTER, MASSACHUSETTS
DAM INSPECTION REPORT

OWNED BY _____ PLACE _____ USE _____

INSPECTED BY Lt Spafford DATE 3/24/54

TYPE OF DAM Earth - Stone Breast Wall CONDITION _____

SPILLWAY

FLASHBOARDS IN PLACE ± 2 ft RECENT REPAIRS None

CONDITION Good

REPAIRS NEEDED _____

EMBANKMENT

RECENT REPAIRS None

CONDITION Good

REPAIRS NEEDED _____

GATES No draw gate on dam

RECENT REPAIRS _____

CONDITION _____

REPAIRS NEEDED _____

LEAKS

HOW SERIOUS None visible

DATE _____

TOWN Winchester
LOCATION Masomac Lake

DAM NO. 60-01
STREAM _____

WORCESTER COUNTY ENGINEERING DEPARTMENT
WORCESTER, MASSACHUSETTS

DAM INSPECTION REPORT

OWNED BY N. D. White & Son Inc PLACE Winchester USE _____
INSPECTED BY LOM - young white DATE 1956
TYPE OF DAM _____ CONDITION _____

SPILLWAY

FLASHBOARDS IN PLACE None RECENT REPAIRS _____
CONDITION Good
REPAIRS NEEDED None

EMBANKMENT

RECENT REPAIRS None
CONDITION Fair to Good
REPAIRS NEEDED None

GATES

RECENT REPAIRS None
CONDITION Good
REPAIRS NEEDED None

LEAKS

HOW SERIOUS _____

DATE 52

LOM
COUNTY ENGINEER

TOWN Winchendon DAM NO. 60-01
LOCATION Mill Pond STREAM N. D. White & Sme
Millon River

WORCESTER COUNTY ENGINEERING DEPARTMENT
WORCESTER, MASSACHUSETTS

D A M I N S P E C T I O N R E P O R T

Owned by N. D. White & Sme Place Winchendon Use _____
Inspected by GGP Date July 12, 1958
Type of Dam _____ Condition Fair

SPILLWAY

Flashboards in Place Remove flashboards Recent Repairs None
Condition Fair - remove flash boards
Repairs Needed cut out leaks around spill abts

EMBANKMENT

Recent Repairs should cut brush - check for leak
Condition Downstream wall - check condition
Repairs Needed " " " " "

GATES

Recent Repairs None
Condition Fair
Repairs Needed Place in good working order

LEAKS

How Serious _____

DATE: July 12, 1958 L. D. Marde County Engineer

TOWN Winchendon DAM NO. 60-01
LOCATION Winchendon Springs STREAM Branch - Millers River

WORCESTER COUNTY ENGINEERING DEPARTMENT
WORCESTER, MASSACHUSETTS

D A M I N S P E C T I O N R E P O R T

White Mills, Inc. to be sold to

Owned by Ray Plastics Inc Place Winchendon Use Mill Pond
Inspected by WOL Date May 27, 1959
Type of Dam Earth-Stone-Gurote Condition Good

SPILLWAY

Flashboards in Place 2' of 2" boards Recent Repairs None
Condition Spillway is (29' x 5') Total with 2' of 2" boards in place - pond
Repairs Needed is full to top of boards. Spillway is located on S.E. end
of dam. Foundation is on ledge.

EMBANKMENT

Recent Repairs 350' ± long dam - 15' wide on top - downstream vertical
Condition rubble stone wall - upstream is 1 1/4 to 1 slope with some stone
Repairs Needed paving - upstream near spillway is vertical cemented
stone wall. Height is 12' to 18'

GATES

Recent Repairs _____
Condition Gate into Mill is in good condition
Repairs Needed _____

LEAKS

How Serious No leaks are visible.

DATE: _____ County Engineer

TOWN Winchendon DAM NO. 60-01
LOCATION Winchendon Springs STREAM Millers River

"Mill Pond"
WORCESTER COUNTY ENGINEERING DEPARTMENT
WORCESTER, MASSACHUSETTS

D A M I N S P E C T I O N R E P O R T

Owned by Ray Plastics Inc Place Winchendon Use Mill Pond
Inspected by Lindquist, Padon, Tammaro - Cassidy Date Sept. 1959
Type of Dam Earth - Stone - Concrete Condition Good

SPILLWAY

Flashboards in Place 12" of boards Recent Repairs None
Condition (7 @ 12" x 10" timber uprights and 10" x 10" top timber support
Repairs Needed for flashboards) These timbers are blocking off part of
spillway area - Walkway timbers also block off spillway area.

EMBANKMENT

Recent Repairs _____
Condition Good condition (Flood Patrol.)
Repairs Needed 12" of water over boards

GATES

Recent Repairs _____
Condition No gate in this location
Repairs Needed Gate at Mill Bldg is in good condition.

LEAKS

How Serious No leaks visible

DATE: _____ County Engineer

TOWN Winchendon DAM NO. 60-01

LOCATION above Mills STREAM Branch - Millers River

"Winchendon Springs" "Whites Mill Pond."

WORCESTER COUNTY ENGINEERING DEPARTMENT
WORCESTER, MASSACHUSETTS

D A M I N S P E C T I O N R E P O R T

Owned by Ray Plastic Inc. Place Winchendon Use Mill Pond

Inspected by WOL - GJC Date July 28, 1960.

Type of Dam Earth - Stone - Concrete. Condition Fair

SPILLWAY

Flashboards in Place Yes. Recent Repairs _____

Condition Fair. Walkway should be raised 12" to increase spillway

Repairs Needed ared. Present timber frames and uprights should be
replaced with pin boards.

EMBANKMENT

Recent Repairs _____

Condition Fair.

Repairs Needed Raise low places in embankment to height of
top of abutment walls.

GATES

Recent Repairs _____

Condition Good

Repairs Needed Gate is closed

LEAKS

How Serious No leaks visible.

DATE: _____ County Engineer

TOWN Winchendon DAM NO. 60-01

LOCATION at "Winchendon Springs" STREAM North Branch - Millers River
"Whites Mill Pond"

WORCESTER COUNTY ENGINEERING DEPARTMENT
WORCESTER, MASSACHUSETTS

D A M I N S P E C T I O N R E P O R T

Owned by Ray Plastics Co. Place Winchendon Use Mill Pond

Inspected by WOL Date Nov. 6, 1964

Type of Dam Earth-stone-concrete Condition Fair

SPILLWAY

Flashboards in Place 24" x 6" boards Recent Repairs _____

Condition The rivet bridge and wood uprights should be removed and replaced

Repairs Needed with removable pins and pin boards

This spillway is located on exposed ledge

EMBANKMENT

Recent Repairs The brush should be removed from the embankment

Condition There is a small bridge in the downstream wall 3.50

Repairs Needed perforated at the spillway

GATES

Recent Repairs The gate valve is located in a 4" vertical pipe, located 5'

Condition north side of the spillway in the center of the embankment

Repairs Needed The canal gate in the Mill Pond is OK - the canal is full -

-the plant cover at the canal inlet structure is in poor condition.

LEAKS

How Serious There is a small leak at top of the wall - north side of the spillway.

DATE: _____ County Engineer

TOWN Winchendon

DAM NO. 68-01

LOCATION Winchendon Springs

STREAM North Branch - Miller River

WORCESTER COUNTY ENGINEERING DEPARTMENT
WORCESTER, MASSACHUSETTS

DAM INSPECTION REPORT

Owned by Ray Plastic Co Place Winchendon Use Mill Pond

Inspected by WCC Date Oct 3, 1967

Type of Dam Earth and Stone Dam Condition Good to Fair

SPILLWAY

Flashboards in Place 2x's of 2" boards Recent Repairs _____

Condition Timbers are beginning to rot - should be rebuilt using

Repairs Needed pin boards on Walkway and wood stringers should be
raised above abutment walls

EMBANKMENT

Recent Repairs _____

Condition Good condition - except some large trees on top

Repairs Needed at embankment. Some stones are missing on
upstream wall near spillway. Also raise emb 12" near spillway.

GATES

Recent Repairs Recent repairs to concrete gate intake structure

Conditions - at intake to 1967.

Repairs Needed New screen in front of intake to structure.

LEAKS

How Serious No leaks are visible

DATE: _____

County Engineer

INSPECTION REPORT & DATA FOR DAMS

Dam No. 60-01
 Town: Winchendon
 Stream: Millers River
 Pond: Spring Village Pl (White's Mill Pk)
 Date: 12-27-71
 By: Eaton & Cany
 CONDITION RATING
 Structural: Good
 Hydraulic: 28.5 x 4.5
 General: Good
 PRIORITY: ---

Owner: Ray Plastics, Inc.
 His Address: Allen Allen St., Winchendon
 Function of Dam: Storage

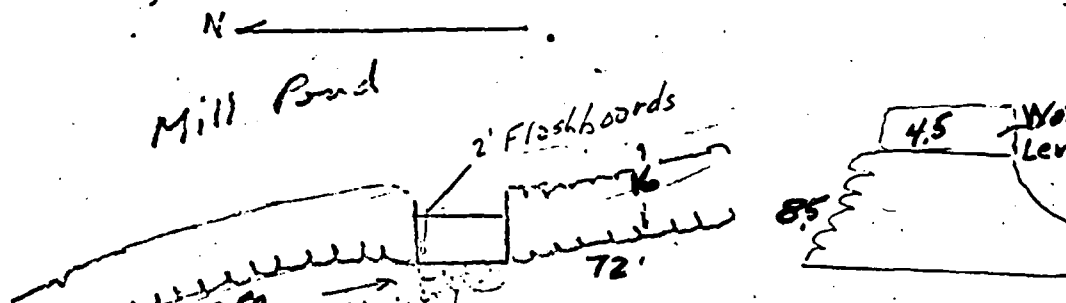
Location & Access: off Glen Allen St. in back of Ray
Plastics - Drive through gate.
 USGS Quad. Winchendon Lat. 42° 41' 45" Long. 72° 00' 40"
 Drain. Ar.: 2.1 Sq. Mi.; Ponds: --- ac.; Res. @ dam: ---
 Character of D.A.: ---

Estimated
 Discharge: ---
 Capacity: ---

General Description of Dam and Discharge Control:

Stone faced, earth filled dam. Concrete spillway
2' of Flashboards with 2' more possible

Sketch (Not to Scale):



Remarks and Recommendations:

Trees to 6" and bushes should be cut.

Date 12/27/71 By Eaton & Cany Comment ---

APPENDIX C

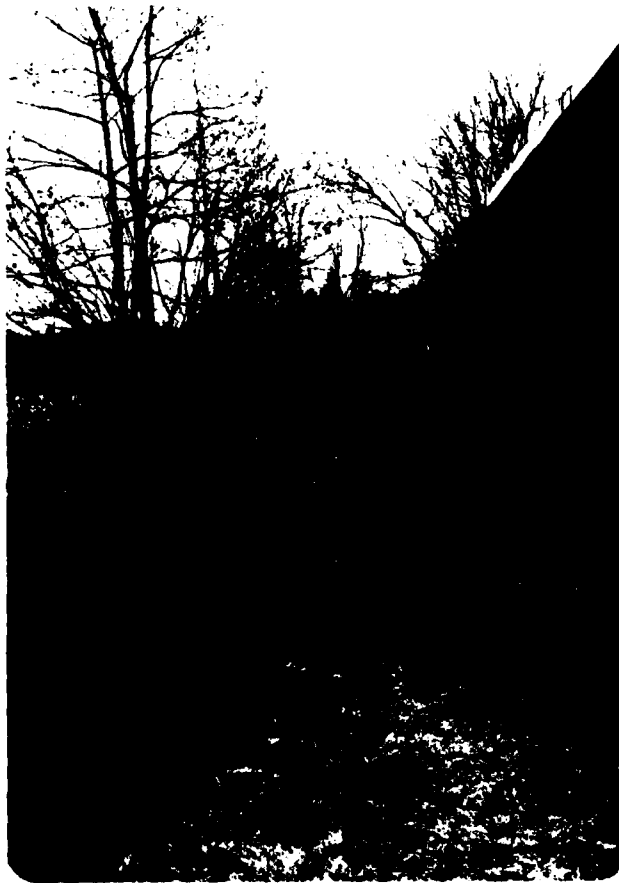
PHOTOGRAPHS

Note: Location and direction of photographs shown on
Figure B-1 in Appendix B.

WHITE'S MILL POND DAM



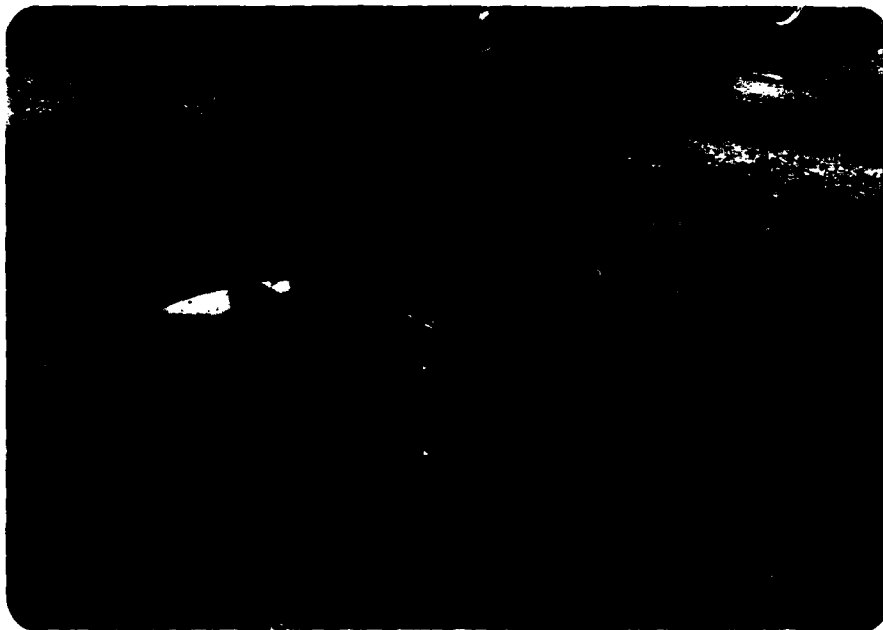
NO. 1 FOOT BRIDGE ACROSS SPILLWAY.



NO. 2 PATH ALONG TOP OF DAM.



NO. 3 SEEPAGE AREA AT DOWNSTREAM TOE OF DAM



NO. 4 SCREENED INTAKE FOR SERVICE AND FIRE LINES.



**NO. 5 DOWNSTREAM VIEW OF LOW LEVEL
OUTLET.**



**NO. 6 VIEW OF SPILLWAY DISCHARGE CHANNEL SHOWING
UPROOTED TREES AND LOGS.**



**NO. 7 DRY STONE MASONRY WALL,
RIGHT SIDE OF SPILLWAY.**



NO. 8 BRIDGE OVER SPILLWAY DISCHARGE CHANNEL.



NO. 9 SPILLWAY DISCHARGE CHANNEL UNDER THE
FACTORY BUILDING.



NO. 10 VIEW ALONG TOP OF THE DIKE.

APPENDIX D
HYDROLOGIC AND HYDRAULIC
COMPUTATIONS

	<u>Page</u>
Figure D-1, Drainage Area Map	D-1
Hydrologic and Hydraulic Computations	D-2

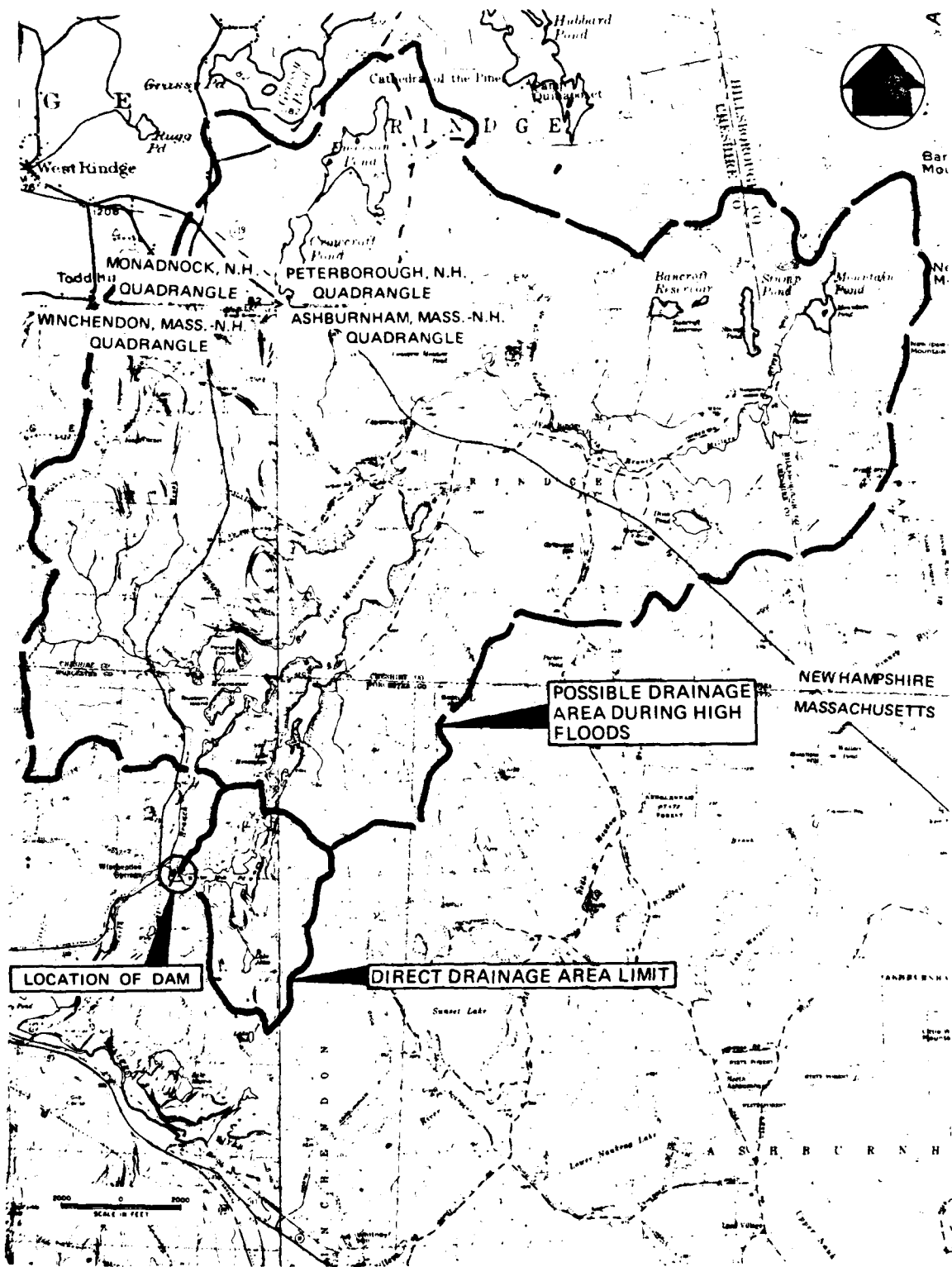


FIG. D-1 DRAINAGE AREA MAP

WHITE'S MILL POND DAM

I Test Flood, Storage & Storage Function - Lake Monomonic

1- Total Drainage Area - 19.06 mi²

2- Pond(s) Area: .09 + .02 + .06 + .06 + .03 + .01 + .12 + .18 = 0.57 mi²
 Swamp(s) Area: .08 + .06 + .12 + .04 + .06 + .03 + .05 + .09 + .16 + .02 = 0.71 mi²
Total Area Pond(s) & Swamp(s): 1.28

$$\% \text{Ponds \& Swamps} = \frac{1.28}{19.06} = 6.7\%$$

$$3- \frac{1316 - 1044}{31300} = .00869$$

} Say Ave Slope = 0.9%

4- Using C. of E. Curves for Peak Flow Rates & above guide values the Peak Flow Rate was estimated to be slightly above "Flat & Coastal" and taken at 850 c.f.s./mi²
 Size Class: — ; Hazard Pot.: — ; Spill. Des. Flood: —
 Use: Test Flood = 1/2 PMF (to match Whites Pond test flood)

5- Test Flood Inflow = 1/2(850)19.06 = 8100 c.f.s.

6- Pond Storage

The pond area is 0.97 sq. mi. at elev. 1044.
 Based on a const. area, storage increases at 621 ac. feet per foot of depth increase.

7- Spillway crest elev. is elev. 1048.5

8- Storage Functions are based on $Q_{out} = Q_{in} [1 - \frac{S_{out}}{R}]$

S_{out} = Storage Vol. in Reservoir related to final Q_{out} in terms of inches of rain over the drainage area.

$$S(\text{in Inches}) = 12 D \left(\frac{0.97}{19.06} \right) = 0.61 D \quad D, R = 6 \text{ hr rain of storm}$$

D = Storage depth in feet above spillway crest in reservoir

9- Storage Functions: (Test Flood & 1/2 PMF - if needed)

F_{TF}	=	8100	-	852.7 S	=	8100 - 521 D
$F_{1/2 PMF}$	=	-		S	=	- D

II Discharge Relations - Lake Monomonic

1- Spillway (Use Williams & Hazen "Hydr. Tables")

Length: $48.2' + 86.7' = 134.9' @ \text{elev. } 1048.5 \pm$

Lake Elev.	1049	1050	1051	1052	1053	1054	1056	1058	1059
q	1.20	6.09	13.01	21.60	31.47	42.63	63.66*	84.69*	95.20*
Q_1	160	820	1760	2910	4250	5750	8590	11420	12840

*Extrapolated

2- Beside Spillway

$4' @ \text{el. } 1051.5$ & $30' @ \text{el. } 1052 \pm$, use $q = 2.55 h^{1.5}$

Lake Elev	1052	1053	1054	1055	1056	1057	1058
h_A	0.5	1.5	2.5	3.5	4.5	5.5	6.5
Q_A	—	20	40	70	100	130	170
h_B	—	1	2	3	4	5	6
Q_B	—	80	220	490	610	860	1120
ΣQ_2	0	100	260	470	710	990	1290

3- Siphon to Whites Mill Pond

30" ϕ pipe siphon - max. head = $1053.5 - 1042.1 = 11.4'$

Max $V = \sqrt{2g(11.4)} = 27.1 \text{ fps}$, $Q_{\text{max}} = 133 \text{ cfs}$

Assume ave. flow of 100 cfs during storm w/ max head = $6' \pm$

4- Crest Flow to Whites Mill Pond

337' total length - $\pm 100' @ 1053.5'$ & $237' @ 1054$, $q = 2.55(h)^{1.5}$

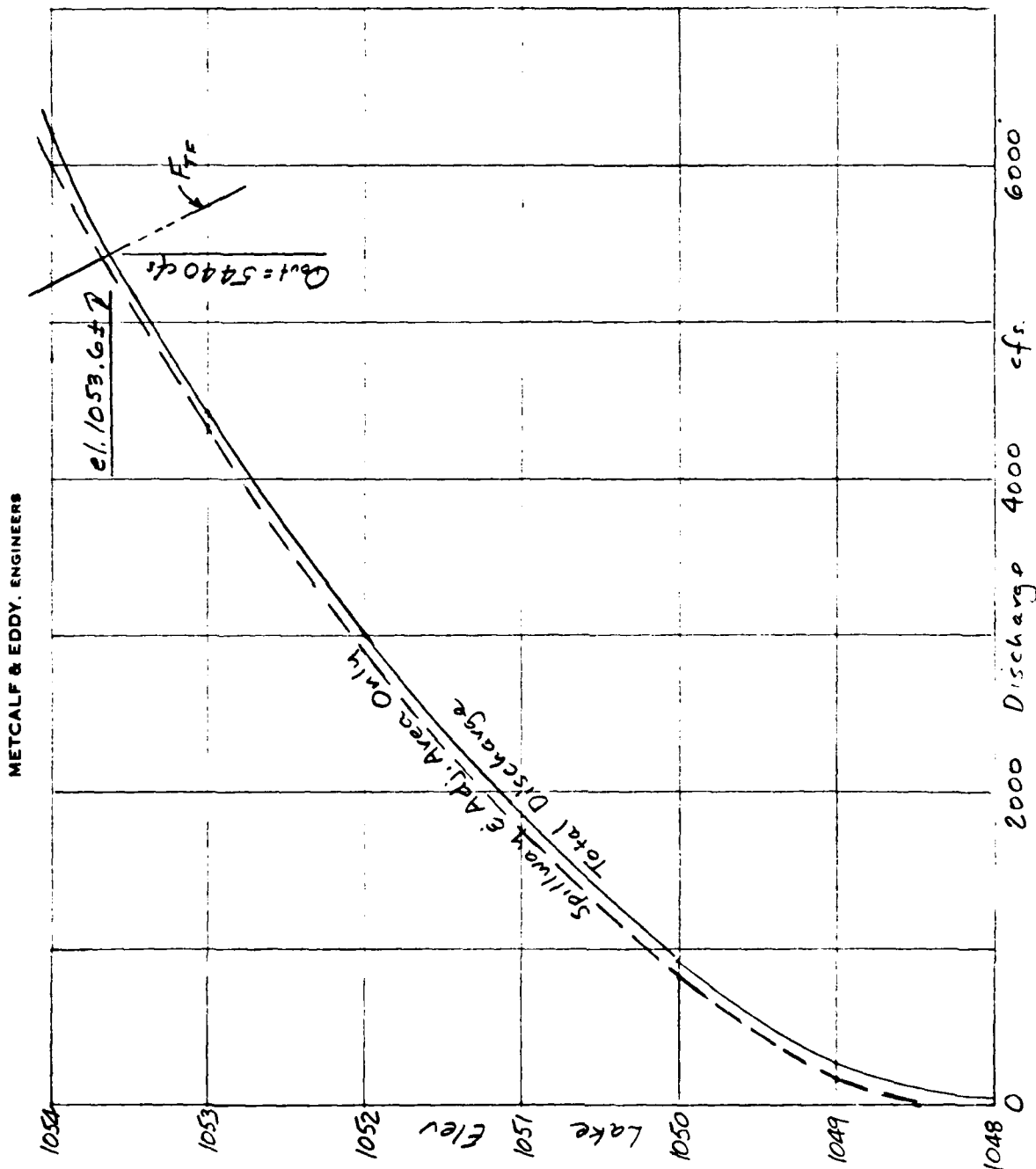
Lake Elev.	1054	1055	1056	1057	1058	1059	1053.6
Q_A	90	470	1010	1670	2430	3290	10
Q_B	—	600	1710	3140	4830	6760	—
ΣQ_4	90	1070	2720	4810	7260	10050	10

Crest Flow under test flood = 0.1 cfs/ft \rightarrow

Project Nat. Review of Non Federal Dams Acct No 6926 Page 3 of 8
 Subject Worcester County, Mass. Comptd By LEB Date 5/28/80
 Detail WHITES MILL POND Ckd By RNH Date 6/6/80

III Discharge & Storage Function vs Lake Elev. - LAKE MONOMONAC

For Test Flood = $\frac{1}{2}$ PMF



Project Nat. Review of Non Fed. Dams Acct No 6926 Page 4 of 8
 Subject Worcester County, Mass. Comptd By LEB Date 4/21/80
 Detail WHITES MILL POND Ckd By RWA Date 6/6/80

IV Test Flood, Storage & Storage Function

1- Total Drainage Area - 0.94 mi² (exclusive of Lake Monomac drain. area)

2- Pond(s) Area: —

Swamp(s) Area: .08 + .02 + .01 + .01 = 0.12 mi²

Total Area Pond(s) & Swamp(s): 0.12 mi²

% Ponds & Swamps = $\frac{0.12}{0.94} = 12.7\%$

3- $\frac{1203 - 1039}{9800} = .03417$

} Say Ave Slope = 3.5%

4- Using C. of E. Curves for Peak Flow Rate & above guide values the Peak Flow Rate was estimated to be between "Rolling" and "Flat & Coastal" and taken at 1800 c.f.s./mi.
 Size Class: Small ; Hazard Pot.: High ; Spill. Des. Flood: 1/2 to Full PMF
 Use: Test Flood = 1/2 PMF

5- Test Flood Inflow = $\frac{1}{2}(1800) 0.94 = 846^* \text{ cfs.}$

* Add 110 cfs from L. Monomac for total of 956 cfs.

6- Pond Storage

The pond area is 0.06 sq. mi. at elev.

Based on a const. area, storage increases at 40 ac. feet per foot of depth increase.

7- Spillway crest elev. is 1037

8- Storage Functions are based on $Q_{out} = Q_{in} \left[1 - \frac{S_{out}}{R} \right]$

S_{out} = Storage Vol. in Reservoir related to final Q_{out} in terms of inches of rain over the drainage area.

$S(\text{in Inches}) = 12 D \left(\frac{.06}{.94} \right) = .766 D$; $R = 6 \text{ hr rain of storm}$

D = Storage depth in feet above spillway crest in reservoir

9- Storage Functions: (Test Flood & 1/2 PMF - if needed)

$F_{TF} = 956 - 89.1^* S = 956 - 68.2^* D$

$F_{1/2 PMF} = F_{TF}$

$S = - D$

* Inflow from L. Monomac not included in Q_{in}/R

(V) Discharge Relations - Whites Mill Pond

1- Spillway Without Stoplogs (supports in place)

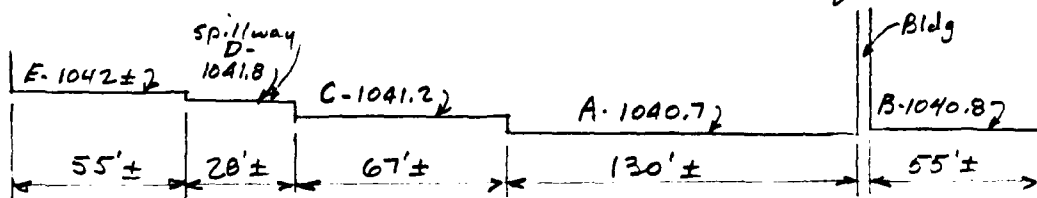
Critical flow at upstr. crest - el. 1037.0; net width = 24' ±
 $y_c = \frac{2}{3}(\text{Pond El.} - 1037.0)$; $q = (y_c^3 g)^{1/4}$

Pond El.	1038	1039	1040	1041	1042	1042.5
h	1	2	3	4	5	5.5
y_c	0.67	1.33	2	2.67	3.33	3.67
Q_1	70	210	390	590	830	960

2- Spillway With Stoplogs - top at el. 1039.0 - net width = 24' ±
 Up to pond el. 1042 assume weir flow & use Williams & Hazen "Hydr. Tables"
 over el. 1042 assume orifice flow $Q = (A \times 2.2) 6(0.16) \sqrt{2gh}$ - & el. 1040.1
 - include flow over top in crest flow calc.

Pond El.	1040	1041	1042	1043	1044	1042.5
q	3.33	9.32	17.10	—	—	—
Q_2	80	220	410	430	500	390

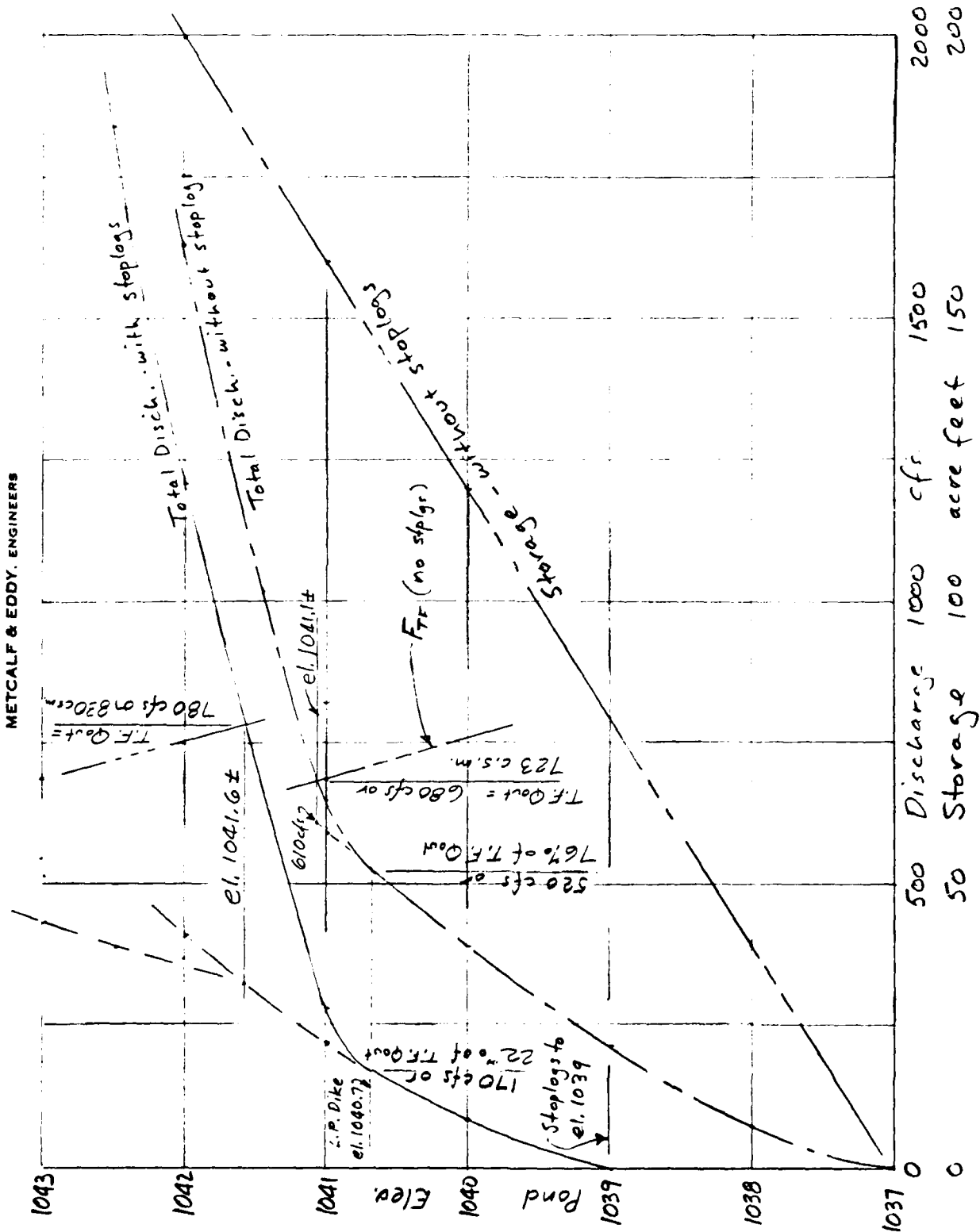
3- Crest Flow (No outlet for flow over dike) $q = 2.55 H^{1.5}$



Pond El.	1041	1042	1043	1042.5
Q_A	50	490	1160	800
Q_B	10	180	460	310
Q_C	—	120	410	250
Q_D	—	10	90	40
Q_E	—	—	140	50
ΣQ_3	60	800	2260	1450

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 Detail WHITES MILL POND Ckd By RWH Date 6/6/80

VI Discharge, Storage & Storage Funct. vs Pond Elev - Whites Mill Pond



(VII) Test Flood Crest Discharge - Whites Mill Pond

1- With Stoplogs

Max. water surf. elev 1041.7
 Elev. of low point 1040.7
 Net head on crest 1.0

$$q = 2.55(1.0)^{1.5} = 2.55 \text{ cfs/ft of crest length}$$

$$\text{Critical depth} = 0.59 \text{ ft.}$$

$$\text{Critical velocity} = 4.3 \text{ fps}$$

2- Without Stoplogs

Max. water surf. elev. 1041.2
 Elev. of low point 1040.7
 Net head on crest 0.5

$$q = 2.55(0.5)^{1.5} = 0.90 \text{ cfs/ft. of crest length}$$

$$\text{Critical depth} = 0.29 \text{ ft.}$$

$$\text{Critical velocity} = 3.1 \text{ fps}$$

(VIII) Low Level Outlet (if operable)

Stone box culvert 3.2' x 1.0' high - inv. el. 1030.4 - ϕ elev. 1031.3

$$\text{Head} = \text{total loss} = (0.5 \text{ ent} + 1.0 \text{ exit} + 1.0 \text{ frict.}) \frac{V^2}{2g}; Q = 29.2 (\text{Head})^{1/2}$$

Pond el.	1039	1038	1037	1036
H	7.7	6.7	5.7	4.7
Q	81	76	70	63

$$\text{For ave discharge rate of } 70 \text{ cfs} \pm, \text{ time to lower pond by 1 foot} = \frac{40(43560)}{70(3600)} = 7 \text{ hours} \pm$$

(IX) Failure of Dam

Peak Failure Flow:

Pond Elevation - 1040.7

Toe Elevation - 1027.7

$$Y_0 = 13.0$$

Dam Length Subject to Breaching = $3 \times 13 = 39'$

$$W_0 = 40\%$$

$$Q_{P_1} = 1.68 W_0 (Y_0)^{1.5} = 1.68 (39) (13)^{1.5} = 3100 \text{ cfs}$$

Total Flow: with steps 3270 cfs; without steps 3630 cfs

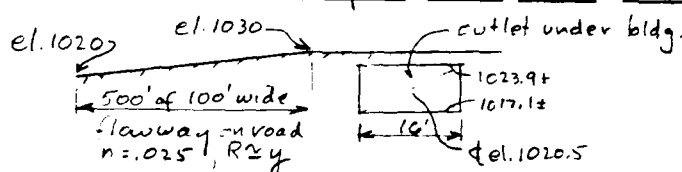
Storage Volume Released:

Storage Above Spillway: $40 \times 3.7 = 148 \text{ ac ft}$

Storage Below Spillway: $40 \times 9.3 \times \frac{1}{2} = 124 \text{ " "}$

$$S = \text{Total Storage} = 272$$

Channel Hydraulics: - Behind Factory

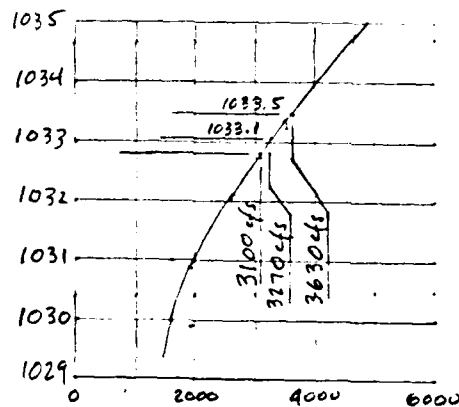


$$Q_1 = \frac{1.49}{0.25} y^{1/3} \left(\frac{10}{500} \right)^{1/2} (100y) = 842.9 y^{1/3}$$

$$Q_2 = 0.6 (16 \times 6.8) \sqrt{2gH} = 523.9 \sqrt{H}$$

$$\text{Pool El.} = 1030 + y + \frac{V^2}{2g} \text{ on flowway}$$

y	0.5	1.0	1.5	2.0	0.0
A	50	100	150	200	-
V	5.3	8.4	11.0	13.4	-
V _{1/2}	0.4	1.1	1.9	2.8	-
Pool El.	1030.9	1032.1	1033.4	1034.8	1030
Q ₁	270	840	1660	2680	-
H	10.4	11.6	12.9	14.3	9.5
Q ₂	1690	1780	1880	1980	1610
ΣQ	1960	2620	3540	4660	1610



Dam failure raises water level against back of factory by ± 10 feet above top of normal outlet

Time to Drain:

$$\frac{43560 (272)}{3600 (\frac{1}{2}) (3100)} = 2.1 \text{ Hours, or 127 Min.}$$

APPENDIX E

INFORMATION AS CONTAINED IN THE
NATIONAL INVENTORY OF DAMS

WHITE'S MILL POND DAM

NOT AVAILABLE AT THIS TIME

END

FILMED

8-85

DTIC